Evaluation of Knowledge About Osteoporosis Risk Factors Among Postmenopausal Women and Men Older Than 40 Years

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ABSTRACT

This study aims to assess and evaluate the knowledge of osteoporosis risk factors among postmenopausal women and men over the age of 40. This is a cross-sectional study conducted from April 2024 to June 2024. The survey was distributed online among Saudi males and females aged 40 years and older residing in the Western region of Saudi Arabia. This study involved 491 participants from the Western region of Saudi Arabia. Participants completed self-administered online surveys, ensuring anonymity. The data was cleaned in Excel spreadsheets and analyzed using SPSS. The mean score for correct responses was 7.89 ± 2.85. The majority (451, 92.04%) of participants recognized the link between osteoporosis and an increased risk of fractures, with 445 (90.82%) being aware that low calcium levels are associated with osteoporosis. Statistically significant associations were found between the place of birth, marital status, education level, occupation, and income level with knowledge about osteoporosis risk factors, with p-values < 0.05 (0.02*, 0.006, <0.001**, <0.001**, and 0.002**, respectively). The study found that the population in the Western region of Saudi Arabia has a reasonably good understanding of osteoporosis risk factors. However, there are notable knowledge gaps regarding gender variations in osteoporosis prevalence, the role of genetics as a risk factor, and hormone replacement therapy as a preventive measure. Enhanced public awareness about these aspects is needed to improve disease prevention and overall quality of life for both the elderly and the general population in Saudi Arabia.**

Keywords: osteoporosis, risk factors, postmenopausal, fractures

INTRODUCTION

Osteoporosis is a complex metabolic bone disorder characterized by decreased bone mass and progressive deterioration of the bone microarchitecture, leading to increased bone fragility and a heightened risk of fractures even from mild trauma[1]. The disease is broadly categorized into primary and secondary types. Primary osteoporosis encompasses age-related (Type II) and postmenopausal (Type I) subtypes, with the latter linked to estrogen deficiency in women. In contrast, secondary osteoporosis arises from identifiable causes such as endocrine disorders or medication use[2].

Research indicates that bone loss begins in both men and women between the ages of thirty and forty. Women experience a significant reduction in bone mass and density within a year of menopause. This accelerated rate of bone loss stabilizes after approximately ten years, transitioning into a more gradual, age-related loss[3]. According to the International Osteoporosis Foundation, around 10% of women in their 60s have osteoporosis, with prevalence increasing to 25% in women in their 70s and 26% in those in their 80s. Osteoporosis also affects the male population, with 21% of Saudi Arabian men suffering from the condition. Epidemiological studies suggest that a 10% increase in peak bone mass can delay the onset of osteoporosis by over ten years. Conversely, a 6.4% decrease in peak bone mass can double the risk of fractures[4].

Several factors contribute to osteoporosis, including both constant and variable elements such as environmental and genetic factors[5]. These factors can independently or collectively lead to significant bone mass loss. Recent research highlights that poor lifestyle choices are a major contributor to the rapid decline in bone mineral density in postmenopausal women[6]. Osteoporosis is an increasingly significant health issue associated with a lower quality of life and higher mortality rates. It is now considered the second most critical health condition in the developed world, following heart disease[7]. Previous studies have shown that osteoporotic fractures often lead to severe medical complications, including cardiac diseases, venous thromboembolism, pneumonia, urinary tract issues, gastrointestinal bleeding, and fluid/electrolyte abnormalities[8].

Identifying gaps in the public's knowledge about osteoporosis is crucial, as such gaps can hinder early prevention efforts, especially in countries where osteoporosis is prevalent. To improve early detection and management of the disease, the Saudi Ministry of Health launched a national plan in 2018 targeting family doctors and primary care professionals. Evidence suggests that individuals with higher awareness of osteoporosis are more likely to adopt preventative behaviors. Despite these insights, numerous studies have documented a lack of understanding about osteoporosis and its risks among both the public and medical professionals[1]. Therefore, this study aims to assess and evaluate the knowledge of osteoporosis risk factors among postmenopausal women and men over the age of 40.

METHODS

Study Design, Setting, and Population: This research employed a cross-sectional study design conducted from April 2024 to June 2024. The survey was distributed online via a link (supplement 1) and targeted Saudi males and females aged 40 years and older residing in the Western region of Saudi Arabia.

Sample Size and Sampling Technique: Sample size calculations were performed using the Cochrane sample size calculator, with a 95% confidence interval, an assumed proportion of 0.5, and a margin

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of error of 5%. The estimated sample size was over 385. However, A total of 600 surveys were distributed, with 491 participants ultimately included who completed the survey, yielding a response rate of 81.8%. The sampling technique used was proportional cluster sampling.

The study utilized online surveys, which may introduce sampling bias due to the underrepresentation of individuals with limited internet access or technological literacy. Despite this limitation, the proportional cluster sampling technique aimed to ensure diversity across demographic groups.

Inclusion and Exclusion Criteria: Inclusion criteria were: Saudi nationals residing in the Western region of Saudi Arabia who were 40 years or older. Exclusion criteria included non-Saudi individuals, those under 40 years of age, and individuals living outside the Western region of Saudi Arabia.

Validity and Reliability: Reliability was assessed using Cronbach's alpha, yielding an alpha value of 0.7 for the Arabic version of the survey. Validity was confirmed as all questions were significantly correlated with the overall knowledge score, with correlation coefficients $r \geq 0.3$.

Statistical Considerations: Data were coded and analyzed using JMP statistical software, version 14. Descriptive and inferential statistics were employed to examine the study variables. Descriptive statistics included counts, percentages, and mean ± standard deviation. Two-sample independent t-tests and One-Way ANOVA were used to evaluate differences in knowledge of osteoporosis risk factors. The significance level was set at $\alpha = 0.05$.

Ethical Considerations: The study received ethical approval from Taif University's Committee (approval number HAO-02-T-105). The study adhered to ethical standards by ensuring confidentiality and obtaining informed consent. Participants were assured of the confidentiality of their responses and were informed of their right to withdraw from the study at any time.

RESULT

Demographic characteristics are summarized in Table 1. The majority of participants (60%) were between 40 and 49 years old, with a smaller number being over 60 years old. More than half of the participants were female, and 43% resided in Jeddah, with fewer participants from Makkah, Yanbu, and other cities in the Western region (8%, 1%, and 6%, respectively). Over three-quarters of the participants were married (79%). A significant portion had university-level education (67%), and 31% were employed in the educational sector. Income levels were distributed similarly across categories, with those earning more than 12,000 SAR being the most common. Approximately 77% of participants were assumed to have a background Knowledge of osteoporosis risk factors.

Table 1. Baseline characteristics among the studied sample. N=491

Character	Count	%
Age		
40-49	296	60.41
50-59	145	29.59
≥60	49	10
Gender		
Female	288	58.78
Male	202	41.22
Place of residence		
Taif	117	23.88
Madinah	83	16.94
Jeddah	211	43.06
Makkah	41	8.37
Yanbu	7	1.43
Other west cities	31	6.33
Marital status		
Single	56	11.43
Married	391	79.8
Divorce	31	6.33
Widow	12	2.45
Educational level		
Not educated	7	1.43
Elementary school	9	1.84
Middle school	20	4.08
High school	125	25.51
University	329	67.14
Occupation		
Educational	153	31.22
Health	70	14.29
Military	37	7.55
Other	111	22.65
Unemployed	119	24.29
Income level		
Less than 5000	125	25.51
5000-12000	181	36.94
More than 12000	184	37.55
Background Knowledge of Osteoporosis Risk Factors		
Yes	378	77.14
No	84	17.14
Don’t know	28	5.71

Table 2 illustrates the responses to questions on osteoporosis knowledge among participants. Most participants answered questions correctly except for those concerning sex differences, genetics, hormone replacement therapy, menopause, and overweight, where incorrect responses were more prevalent (80%, 55.1%, 74.08%, 53.67%, and 57.96%, respectively).

Table 2. Knowledge about osteoporosis risk factors.

Statements	Correct answers	
	Count	%
Osteoporosis is linked to an increased risk of fractures	451	92.04
Osteoporosis affects men more than women	98	20
Smoking increases the chance of osteoporosis	318	64.9
Genetics has a role in osteoporosis	220	44.9
Chronic diseases like diabetes increase the chance of osteoporosis	300	61.22
Osteoporosis is linked to low calcium levels	445	90.82
Osteoporosis is linked to low vitamin D levels	386	78.78
Reduced exposure to sunlight is a risk factor for osteoporosis	414	84.49

Hormone replacement therapy protects against osteoporosis	127	25.92
Menopause is a risk factor for osteoporosis	227	46.33
Osteoporosis is more common among people with increased weight	206	42.04
Use of cortisone can precipitate osteoporosis	295	60.2
Walking exercise is an important preventive factor for osteoporosis	382	77.96
Total Score of knowledge mean ± SD	7.89 ± 2.85	

The overall knowledge score regarding osteoporosis risk factors was analyzed using One-Way ANOVA and two-sample independent t-tests; the analysis revealed significant differences in mean knowledge scores based on place of residence, marital status, educational level, occupation, and income level (Table 3). All observed differences were statistically significant, with p-values less than 0.05.

Table 3. Osteoporosis total knowledge in relation to related demographic factors.

Characters	Total knowledge Mean ± SD	P-value
Age		
40-49	7.72 ± 2.91	0.2
50-59	8.19 ± 2.79	
≥60	8.06 ± 2.58	
Gender		
	8.07 ± 2.76	0.09
Female	7.63 ± 2.96	
Male		
Place of residence		
	8 ± 2.97	
Taif	7.89 ± 2.73	
Madinah	7.98 ± 2.64	0.02*
Jeddah	8.51 ± 2.55	
Makkah	5.85 ± 2.60	
Yanbu	6.58 ± 3.97	
Other west cities		
Marital status		
	7.96 ± 3.06	
Single	8.02 ± 2.74	0.006**
Married	7.03 ± 3.52	
Divorce	5.5 ± 2.46	
Widow		
Educational level		
	7.14 ± 2.96	
Not educated	6.11 ± 3.01	
Elementary school	6.55 ± 3.05	<0.001**
Middle school	6.70 ± 3.04	
High school	8.49 ± 2.57	
University		
Occupation		
	8.37 ± 2.45	
Educational	9.77 ± 2.53	
Health	6.78 ± 3.08	<0.001**
Military	7.16 ± 2.93	
Other	7.20 ± 2.75	
Unemployed		
Income level		
	7.69 ± 2.97	
Less than 5000	7.45 ± 2.93	0.002**
5000-12000	8.46 ± 2.60	
More than 12000		

DISCUSSION

The results of this study reveal a notable understanding of osteoporosis risk factors among postmenopausal women and men over 40 in the Western region of Saudi Arabia. With a mean knowledge score of 7.89 ± 2.85, participants exhibited a moderate grasp of the condition's risk factors. This level of Overall Knowledge of osteoporosis aligns with findings from other studies, such as those by El Hage et al. in Lebanon and Rundasa et al. in Western Ethiopia, which also reported moderate knowledge levels among similar demographics[9,10]. Impressively, 92.04% of participants correctly identified the increased risk of fractures associated with osteoporosis. Additionally, the majority recognized the link between low calcium levels (90.82%) and insufficient vitamin D (78.78%) with osteoporosis, reflecting findings by Ahad et al., who highlighted the adverse effects of vitamin D deficiency on bone health[11]. Participants also acknowledged sunlight deficiency (84.49%) and smoking (64.90%) as significant risk factors, corroborating Nohra et al.'s findings that smoking is a critical risk factor for osteoporosis[12].

The study also uncovered that general knowledge of osteoporosis was influenced by various demographic factors beyond age and gender, indicating that differences in osteoporosis knowledge were not solely attributable to these characteristics. For example, participants residing in Makkah had a higher knowledge score (8.51 ± 2.55, p=0.02*) compared to those from other areas of Saudi Arabia. Additionally, married participants (8.02 ± 2.74, p=0.006*) demonstrated greater knowledge than those with other marital statuses. Higher knowledge levels were also associated with university education (8.49 ± 2.57, p≤0.001*), consistent with El-Tawab et al.'s observation that individuals with higher education levels have a better understanding of osteoporosis risk factors[13]. Participants working in the health services sector also showed significantly higher awareness (9.77 ± 2.53, p≤0.001*) compared to those in other occupations, likely due to the specialized training and experience gained in healthcare settings[14]. Furthermore, individuals with incomes over 12,000 SAR had higher knowledge scores (8.46 ± 2.60, p=0.002*) compared to those with lower incomes.

Conversely, the study identified gaps in knowledge about preventive measures such as hormone replacement therapy and the role of genetics in osteoporosis. While studies by Senthilraja et al[15]. and Gasparik et al[16]. reported significant awareness of genetics and family history as risk factors for osteoporosis, our study found that less than half of the participants recognized genetics as a risk factor. This suggests a need to improve education on these aspects. The study highlights critical knowledge gaps, particularly regarding gender-specific disparities in osteoporosis prevalence and the role of genetics, emphasizing the need for enhanced public awareness campaigns and preventive health education related to osteoporosis[17].

However, the study has its own limitations, including the cross-sectional design, which prevents causal inferences between attributes. Additionally, reliance on online questionnaires may have introduced response biases, as there was no way to verify the accuracy of the responses provided.

CONCLUSION

The study revealed a moderate level of knowledge about osteoporosis risk factors among the population residing in the western region of Saudi Arabia. While the participants demonstrated a substantial level of knowledge about osteoporosis risk factors, the study identified significant knowledge gaps regarding gender variations in osteoporosis prevalence, genetics as a risk factor, and hormone replacement therapy as a preventive measure of osteoporosis. These findings underscore the need for targeted public health initiatives to enhance awareness, particularly focusing on these underrecognized aspects of osteoporosis. We recommend specialized education campaigns addressing genetic risks, hormonal prevention strategies, and male-specific vulnerability, with particular emphasis on reaching non-healthcare professionals. Such efforts could substantially improve preventive practices, ultimately enhancing quality of life for Saudi Arabia's aging population and reducing the disease burden nationwide.

Authorship Contribution: Abdulmajeed Algethami: Conceptualization; Methodology; Supervision; Writing – Review & Editing. Abdullah Eid Abdullah Alsobaie: Conceptualization; Methodology; Writing – Original Draft Preparation. Razan Aali Alsofiyani: Data Curation; Formal Analysis; Resources; Writing – Original Draft Preparation. Ghadah Mohammed Althobaiti: Data Curation; Formal Analysis; Resources; Writing – Original Draft Preparation. Fahad Abdullah Eid Alqurashi: Data Curation; Formal Analysis; Resources; Writing – Original Draft Preparation. Naif Eid Abdullah Alsobaie: Data Curation; Formal Analysis; Resources; Writing – Original Draft Preparation. Mohammad Ibrahim A. Alwuthaynani: Data Curation; Formal Analysis; Resources; Writing – Original Draft Preparation. Faisal Alhomayani: Supervision; Writing – Review & Editing. Mohammed A Alghamdi: Data Curation; Formal Analysis; Resources; Writing – Original Draft Preparation

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